

# **EXHIBIT**

**E**



**NATIONAL TESTING AND CONSULTING, L.L.C.**

Lake City

14.159

December 3, 2014

Louise Roselle, Esq.  
Markovits, Stock & DeMarco  
119 East Court Street, Suite 530  
Cincinnati, Ohio 45202

Re: Sauter vs. Perfect North Slopes

Ms. Roselle:

As requested, I have reviewed and analyzed information regarding a snow tubing accident that occurred at Perfect North Slopes in Lawrenceburg, Indiana, on January 30, 2011. Ms. M [REDACTED] S [REDACTED], age eight at the time of the accident, was severely injured while snow tubing at the Perfect North Slopes tubing hill when she was struck in the bottom run out area of the tubing hill by a group of five adult tubers that were linked together. The five adult snow tubers were started/pushed down the tubing hill by a Perfect North Slopes employee before striking Ms. S [REDACTED]. This report presents my findings and conclusions reached as a result of my review, analysis, education and experience.

I have historically investigated numerous snow tubing accidents/fatalities across the United States of America, and have been intimately familiar with the design, operation, and maintenance of snow tubing facilities for more than a decade. Please see my curriculum vitae which is attached to this report better describing this experience.

**Background**

On the afternoon of January 30, 2011, the Sauter family went snow tubing at Perfect North Slopes as part of a Boy Scouting trip. Ms. M [REDACTED] S [REDACTED], along with her two brothers, rode the magic carpet lift to the top of the tubing hill. Once at the top of the lift, the Sauter children turned to the left and walked over to the top of Lane 7. There are varying reports/accounts as to what happened during the Sauter children's descent of Lane 7, including the possibility that they did not actually descend on Lane 7. Regardless, once at the bottom of the tubing hill and into the run out area, the Sauter children came to a natural stop. After stopping, M [REDACTED] S [REDACTED]'s two brothers reportedly climbed out of their tubes, but M [REDACTED] was having trouble exiting her tube.

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Consequently, one of her brothers pulled her while she was still in her tube towards the gravel exit area of the tubing hill. As her brother was pulling her towards the exit of the tubing lane, a group of five adults, in a linked configuration, came down the same lane that the Sauter children were walking in.

Perfect North Slopes employee, Sean Stott, who was a bottom attendant of the tubing hill, noticed that the Sauter children were in jeopardy of being struck by the group of five adults coming into the run out area, and made an effort to run towards the Sauter children to physically attempt to prevent the impending collision. Mr. Stott was unable to reach the Sauter children in time to prevent the collision, and the five adults slid into the Sauter children in the tubing lane. During the collision sequence, the five adults struck two of the three Sauter children, most severely injuring M [REDACTED] S [REDACTED] and rendering her unconscious. M [REDACTED] S [REDACTED] was subsequently air lifted from Perfect North Slopes via a medical helicopter due to the nature of her injuries from the collision.

### **Purpose**

The purpose of my review and analysis was to determine the probable cause of the collision in the run out area of the Perfect North Slopes tubing hill.

### **Procedure**

I reviewed and analyzed evidence in the form of both provided and obtained documents.

### **Documents Reviewed**

In conducting this review and analysis, the following documents were reviewed and analyzed:

- Deposition of Alan Henning with pertinent exhibits
- Deposition of Kali Boecker with pertinent exhibits
- Deposition of Thomas Boecker with pertinent exhibits
- Deposition of Andrew Broaddus with pertinent exhibits
- Deposition of Jason Canup with pertinent exhibits
- Deposition of Kelsi Carlson with pertinent exhibits
- Deposition of Christopher Daniel with pertinent exhibits
- Deposition of Stephany Daniel with pertinent exhibits
- Deposition of Deborah Henderson with pertinent exhibits
- Deposition of Keith Hartman with pertinent exhibits
- Deposition of Betty Heist with pertinent exhibits
- Depositions of Chuck Heist with pertinent exhibits
- Deposition of Katherine Hester with pertinent exhibits
- Deposition of Heidi Lehman with pertinent exhibits
- Deposition of Floyd Mettler with pertinent exhibits
- Deposition of Chip Perfect with pertinent exhibits
- Deposition of Thomas Price with pertinent exhibits
- Deposition of James Sauter with pertinent exhibits
- Deposition of J [REDACTED] S [REDACTED] with pertinent exhibits

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- Deposition of M████████████████████████████████ with pertinent exhibits
- Depositions of Piper Sauter with pertinent exhibits
- Deposition of Sean Stott with pertinent exhibits
- Deposition of Robert Urbanski with pertinent exhibits
- Deposition of Anthony Warr with pertinent exhibits
- Deposition of Jenny Warr with pertinent exhibits
- Defendant's Response to Plaintiff's Second Request for Production of Documents
- Google satellite images of the subject tubing hill along with plotted GPS coordinates

### **Tubing Hill Design and Layout**

#### **Tubing Hill**

The tubing hill was constructed on an east-northeast downward sloping hillside with a large gravel run out zone at its terminus. As I have not personally inspected the snow tubing facility at Perfect North Slopes, I have to rely on deposition testimony and photographs that memorialize the tubing lanes. According to diagrams, photographs and testimony, the tubing lanes are straight and approximately 13-feet wide, and the snow berms which divide and separate each individual lane are approximately 1-foot in height. The dividing berms do not extend all the way into the gravel deceleration area.

There are approximately nine tubing lanes on each (northern and southern) sides of the Magic Carpet Lift. At the time of the subject accident, there were reportedly nine tubing lanes to the south of the Magic Carpet lift on the tubing hill. After tubing patrons slide down the lanes into the relatively flat run out area, they may enter a gravel covered area which is designed to slow the tubers down and bring them to a stop without input from the patron. It is noteworthy that the snow berms which serve to separate each snow tubing lane from other lanes do not extend fully into the gravel deceleration zone, potentially allowing tubers descending from different tubing lanes to fan out and/or collide with one another in the run out area.

According the incident diagram, M████████████████████████████████ and her brothers were pushed down Lane 7 on the south side of the lift (lane numbers increase as one gets further away from the lift to the south). During their descent, the Sauter children reportedly crossed over the 1-foot high snow berm separating Lane 7 and Lane 8, and continued down Lane 8 of the tubing hill before coming to a stop. Shortly after pushing the Sauter children down the tubing hill in Lane 7, the top attendant pushed the five adult linked tubers down Lane 8. As they entered the run out area of the tubing hill, the five adults collided with two of the three Sauter children at the bottom of Lane 8.

#### **Potential Collision Scenarios**

Due to the variety of testimony and perspectives of those that witnessed or were involved in the accident, the following collision scenarios must be analyzed:

**Scenario 1:** As described in the Incident Report, the Sauter children crossed over the snow berm between Lane 7 and Lane 8. According to the GPS coordinates provided in the Incident Report, the location of the alleged berm crossing by the Sauters was 486-feet uphill of M████████████████'s

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documented point of rest, which was in the snowy flat section of the tubing hill west of the gravel deceleration area. Figure 1 below shows both GPS points from the Incident Report plotted over aerial imagery of the tubing hill. It should be noted that the alleged crossover point identified in the Incident Report is approximately halfway down the tubing hill.

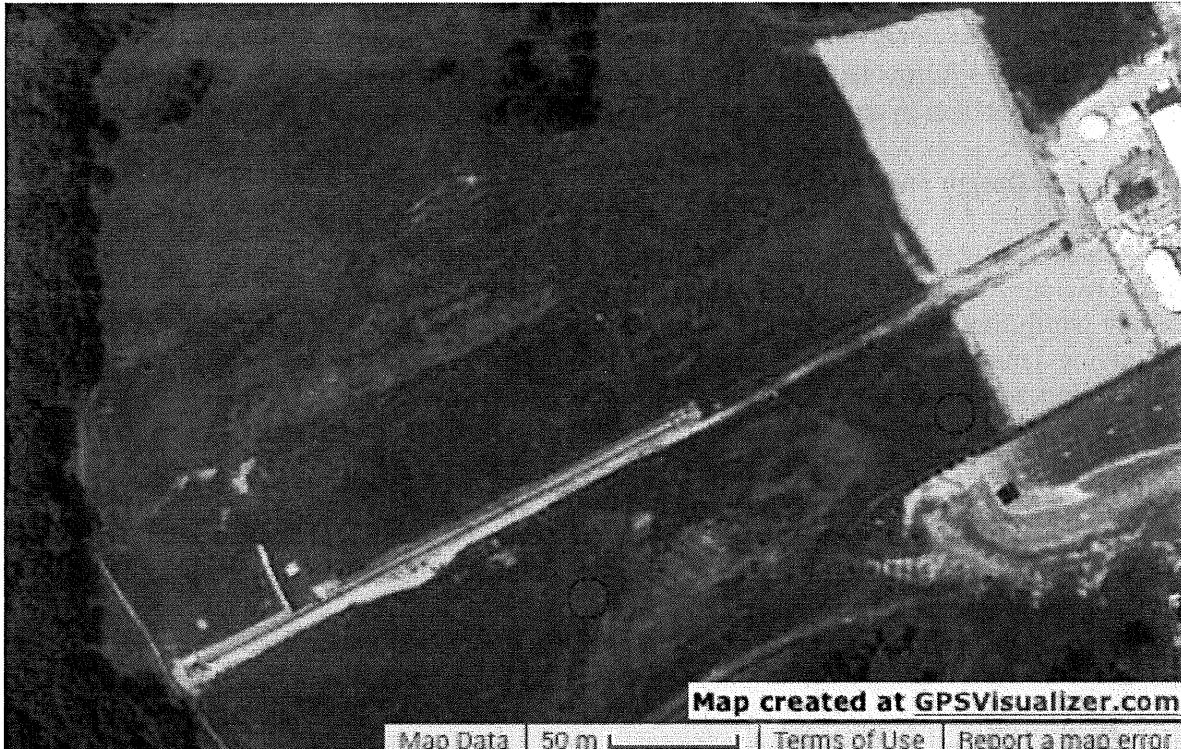


Figure 1 – Aerial photograph of the tubing hill with the two GPS data points from the Incident Report plotted over it. The left red dot is the noted crossover point, and the right red dot is the point of rest at the bottom of the tubing hill. The gravel run out areas can be seen in the right side of the image, and the top of the Magic Carpet lift can be seen near the bottom left corner of the image.

Assuming that the Sauter children reached a maximum velocity of 30 miles per hour near the mid-point of their descent, their average velocity during the last half of the tubing run (after the crossover) was approximately 15 miles per hour (allowing for velocity of zero when they came to a stop). At an average velocity of 15 miles per hour, it would take the Sauter children approximately 22 seconds to travel from the alleged point of crossover to the point at which they stopped in the bottom of the run out area. It would take another 5 to 10 seconds for M [REDACTED] S [REDACTED]’s brothers to get up out of their tubes, pick up M [REDACTED]’s tubing leash, and start dragging her towards the gravel area before they were struck by the group of five adults. This means that there was at least 30 seconds for the bottom tubing attendant to notice that the Sauter children had crossed over into another lane. This analysis also indicates that the top attendant had pushed the five adults down Lane 8 approximately 15-seconds before the Sauter children allegedly crossed over the dividing berm and into Lane 8. This means that there would have had at least 30 seconds where the two tubing groups would have been visible in the same tubing lane.

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It is noteworthy that there are no eyewitness accounts that either party involved in this accident actually crossed over into adjacent tubing lanes.

**Scenario 2:** Another scenario leading up to the subject collision is that the Sauter children, who descended Lane 7, “fanned out” or diverged at the end of the lane once they passed the area where the division berms terminate. While the photographs taken on the day of the accident in which foot prints can be seen in the snow (Figure 2 below), seem to show the presence of a mild berm on each side of Lane 7, deposition testimony indicates that the dividing berms cease to exist in the flat snowy area near the ends of each lane. Therefore, there is an area before the tubers enter the gravel deceleration zone where there are no dividing berms between lanes. The cessation of the dividing berms in this snowy area occurs before the tubers reach the gravel deceleration zone, and such a termination allows the tubers from either lane to “fan out” or diverge once past the termination of the dividing berms. It may be that the Sauter children drifted over into the end of Lane 8 after descending Lane 7 and passing the terminus of the division berm, thereby creating the potential for the collision. In this scenario, there would have been about 10 to 15 seconds for the bottom attendant to notice that the Sauter children had inadvertently entered into the bottom of Lane 8 and respond accordingly. It is noteworthy that “fanning out” is not caused by any actions of the Sauter children, but instead is caused by the design of the tubing hill.

While the above two scenarios provide some insight into the timing of these collision scenarios, both serve to reveal the root cause of the accident. Based upon my analysis and experience, either of Scenarios 1 and 2 occurred due to the lack of sufficiently high and sufficiently long dividing berms between tubing lanes.

The state of the art design of snow tubing dividing berms has, for more than a decade, required the use of berms which were both high enough, steep-sided enough, and long enough that tubing patrons could not escape the lane that they were descending, nor could they interact with other tubers in an open, undivided run out area such as the gravel deceleration zone.

The National Ski Area Association recognized this fact, and at one time published its ***Tubing Operations Resource Guide***, which states, “*Along either edge of the run a berm can be constructed to provide positive separation between runs and to help prevent crossovers onto adjacent runs, lift paths, or other outside areas. Berms approximately 20-24 inches in height work effectively.*” The hazards created by unwanted lane crossovers have been known in the industry for more than a decade, and so has an easy solution to prevent them – adequately sized dividing berms of sufficient length.

It is noteworthy that employees of Perfect North Slopes testified that they had seen tubers cross over between tubing lanes prior to M [REDACTED] S [REDACTED]’s injury; therefore Perfect North Slopes knew of, and was aware of the fact that crossovers occurred. Despite having this knowledge, Perfect North failed to implement simple changes in both the design and construction of the division berms that could have prevented both future crossovers and/or tuber divergence/fan-out once tubers passed the division berm terminus near the bottom of the lanes. Had Perfect North Slopes

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constructed sufficiently high division berms that extended to the end of the gravel deceleration zone, both of these injury scenarios could have been prevented, and M [REDACTED] S [REDACTED] would not have been injured by the five adult tubers colliding with her. The inadequately sized/long division berms were a design defect by Perfect North Slopes. Creating adequately sized/long division berms was technically and economically feasible, and would have mitigated the hazards of crossovers already known to Perfect North Slopes.



Figure 2 – View looking uphill at the base of Lane 8. Lane 7 has a black line drawn up it. The footprints encircled with black marker in the foreground are reportedly associated with M [REDACTED] S [REDACTED]’s point of rest.

**Scenario 3:** This scenario requires no crossover of tubers between lanes. Instead, the top tubing attendant sent both the Sauter children and the five adult tubers down the same lane (Lane 8) without allowing sufficient time for the Sauter children to exit the lane completely before sending the five adults down. It is possible that this scenario occurred, as none of the five adult tubers testified or stated that they changed tubing lanes, and J [REDACTED] S [REDACTED], M [REDACTED] S [REDACTED]’s brother, testified that the Sauter children didn’t change tubing lanes either. It is noteworthy that there are no eyewitness accounts of any lane changes by either party prior to the collision.

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Had this scenario occurred, the cause of the accident would have been the actions of a Perfect North Slopes employee, who failed to wait until the Sauter children were completely out of the lane before sending more tubers down the same lane. Based upon deposition testimony, it appears that the practice of sending new tubers down a lane before other tubers had completely exited the same lane was somewhat common at Perfect North Slopes. Such a practice is not consistent with state of the art tubing hill operation, and is a recipe for a collision at the base of the tubing hill. A review of historical incident reports from the five years prior to the subject accident supports the conclusion that this unsafe practice was occurring with some frequency at Perfect North Slopes. Should Scenario 3 be what actually occurred, the accident was caused by the premature release of additional tubers into Lane 8 by a Perfect North Slopes employee before the lane was clear and safe to tube down. Such an act by a top operator would be an operational error by Perfect North Slopes.

**Scenario 4:** Another scenario is that after the Sauter children came to a natural stop at the bottom of Lane 7, they crossed over into Lane 8 by foot. Perfect North Slopes bottom attendant, Katherine Hester, testified, “I saw one of the little boys coming -- walking over the mound, one of the mounds. He was coming from a different lane into the other one, and then I saw the accident happen.” She testified that she only saw one boy cross over the mound (berm), which would suggest that M█████ never left the lane in which she was struck and came to rest in.

It is noteworthy that Ms. Hester’s testimony is in direct conflict with Mr. Stott’s testimony and the Incident Diagram, and also does not make sense spatially. Had the Sauter children crossed over a dividing snow berm prematurely before exiting the gravel deceleration zone, they would have likely headed towards the lift area, and not further away from it. Heading towards the lift area from Lane 7 would have caused the Sauter children to enter into Lane 6, not Lane 8 where the accident allegedly occurred.

Ms. Hester describes the boy as “coming” and she was standing closer to the lift than Mr. Stott. Therefore “coming” would describe the boy traveling in a direction away from Lane 8, not towards it. I believe that what Ms. Hester testified to was seeing one of the Sauter boys getting out of the way of the oncoming five adults, as one of the Sauter boys was not struck by the adult tubers.

Had Scenario 4 occurred, it would have been the bottom attendant’s responsibility to monitor the Sauter children and clear them from the bottom of the lane into which they crossed. As noted above, Scenario 4 is not supported by any other deposition testimony other than Ms. Hester’s. It should also be noted that Perfect North Slopes did not include this potential scenario in its Incident Report.

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### **Cause of Subject Accident**

As it cannot readily be determined which of the four scenarios actually occurred, the cause of this accident can only be reduced to either a) improper design of the tubing hill by Perfect North Slopes, or b) improper operation of the tubing hill by Perfect North Slopes.

Due to the age and likely corresponding size of the Sauter children, and the fact that they were seated in their tubes during the descent of the tubing hill, it is extremely unlikely that they could have reached the snow tubing lane surface with their hands or feet in a way that would have caused the tubes to cross over the berm between Lane 7 and Lane 8. Snow tubes cannot be steered or directionally controlled. Therefore, the Sauter children did not cause or contribute to this accident in any way. In fact, a Perfect North Slopes employee testified that after the subject collision occurred, that another group of tubers crossed out of Lane 7 and into Lane 8, prompting the closure of Lanes 7, 8, and 9.

It is noteworthy that Perfect North Slopes had no tuber age restrictions, or requirements that Mr. or Mrs. Sauter ride down with their children or wait at the bottom of the hill to assist their children. Had Perfect North Slopes required such parental involvement, it should have issued easily identifiable lift tickets (showing age restriction) and prevented the Sauter children from tubing until parental supervision could be established.

### **Conclusions**

Based on available evidence and this engineer's training, education and experience, the following conclusions were reached within a reasonable degree of engineering certainty:

- The cause of this accident was either a) the improper design of the tubing hill by Perfect North Slopes (Scenarios 1 or 2), or b) the improper operation of the tubing hill by Perfect North Slopes (Scenarios 3 or 4).
- Scenarios 1 and 2 were caused by the lack of sufficiently high and sufficiently long dividing berms.
- The state of the art design of snow tubing dividing berms requires that the dividing berms are high enough, steep-sided enough, and long enough that tubing patrons can not escape the lane that they are descending, nor should they be able to interact with other tubers in an open, undivided run out area such as the gravel deceleration zone.
- Had Perfect North Slopes constructed sufficiently high division berms which extended to the end of the gravel deceleration zone, then both injury Scenarios 1 and 2 could have been prevented.
- Scenario 3 would have been caused by a Perfect North Slopes employee failing to wait until the Sauter children were completely out of Lane 8 before sending more tubers down the same lane. Such a decision was an operating error; well known in the industry to

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result in a collision between tubers at the end of a tubing lane. Had the top attendant waited for the Sauter children to clear Lane 8 before pushing the five adults down the same lane, this accident could have been avoided.

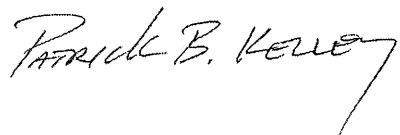
- Had Scenario 4 occurred, it would have been the bottom attendant's responsibility to monitor the Sauter children and clear them from the bottom of the lane into which they crossed.
- The Sauter children did not cause, or contribute to their crossing over the berm between Lane 7 and Lane 8 should a cross-over have actually occurred.
- Perfect North Slopes had no tuber age restrictions or requirements that Mr. or Mrs. Sauter either ride down with their children, or wait at the bottom of the hill to assist their children. Had Perfect North Slopes had an age restriction, or required such parental involvement, it should have prevented the Sauter children from tubing until parental supervision could be established.

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I hold these opinions to a reasonable degree of engineering and scientific probability. The opinions and conclusions expressed in this report are based on the information available to this writer as of the date of this report. As discovery continues, it may be that additional information will become available which will affect our opinions and conclusions. Thank you for the opportunity to perform these services for you. Please do not hesitate to contact this office should you have any questions regarding this report, or if National Testing and Consulting may be of further assistance in another matter.

Yours very truly,  
NATIONAL TESTING AND CONSULTING, L.L.C.



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Patrick B. Kelley, M.E., P.E.  
*President,*  
*Registered Professional Engineer*





**NATIONAL TESTING AND CONSULTING, L.L.C.**

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\$10/ea.  
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\$1.00/page  
\$100/day  
\$100/hr  
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\$10.00/ea.  
\$50/day  
\$75/ea.  
COST + 10%  
COST + 10%

# NTAC

## NATIONAL TESTING AND CONSULTING, L.L.C.

Lake City, Colorado

## CURRICULUM VITAE PATRICK B. KELLEY, M.E., P.E., C.F.E.I.

### TECHNICAL AREAS OF SPECIALIZATION

- \* Metallurgical, materials, and mechanical failure analysis
- \* Materials evaluation and testing
- \* Product liability, design, evaluation, and testing
- \* Chemical/Mechanical system failure analysis
- \* Fire and explosion analysis, failures of fire protection systems
- \* Industrial, recreational, and construction accident analysis
- \* Slip, trip and fall accident analysis
- \* Construction defect analysis

### EDUCATION

Master of Engineering in Metallurgical and Materials Engineering  
with an emphasis on Physical Metallurgy and Failure Analysis  
Colorado School of Mines (2005)

Bachelor of Science in Chemical Engineering and Petroleum Refining  
With a minor in Environmental Science  
Colorado School of Mines (1997)

### PROFESSIONAL EXPERIENCE

2003 - Date      NATIONAL TESTING AND CONSULTING, L.L.C.  
Forensic Engineer  
A professional engineer practicing forensic engineering including metallurgical, materials, and mechanical failure analysis, materials evaluation and testing, product liability and analysis, fire and explosion cause and origin, industrial, recreational, and construction accident analysis, and chemical and mechanical systems failure analysis.

2006 - Date      PIE FORENSIC CONSULTANTS (Formerly Professional Investigative Engineers)  
Consultant – Senior Forensic Engineer  
A consulting professional engineer in the above listed areas of technical specialization.

2002 - 2003      VECTOR SCIENTIFIC, INC. (A division of Knott Laboratory, Inc.)  
Forensic Engineer  
Forensic engineering in the above listed areas of technical specialization.

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2000 – 2002     KNOTT LABORATORY, INC.  
                  Engineer  
                  Forensic engineering in the above listed areas of technical specialization.

1997 – 2000     SPYDERCO, INC.  
                  Research & Development Engineer  
                  Product research, testing, design, and development/manufacturing of pocket knives and hand tools, locking mechanisms, and accessories. Material selection, quality control procedures, and failure analysis of returned components.

1995 – 1997     GOLDEN CITY BREWERY  
                  Brewer  
                  Responsible for kegging, bottling, and brewing processes. Medaled at the Great American Beer Festival.

### **TECHNICAL BACKGROUND**

#### **Metallurgical and Mechanical Failures:**

Analysis and identification of failure modes including ductile and brittle overload fractures, fatigue, distortion, wear, and corrosion failures, hydrogen/stress-corrosion cracking induced failures, elevated temperature/creep failures. Analysis of failures of formed, stamped, drawn, forged, sintered, powdered metal, and cast components, failures of weldments and brazed joints in both ferrous and non-ferrous materials.

#### **Materials Evaluation and Testing:**

Characterization and mechanical testing of metallic and composite materials to verify performance requirements and compliance with applicable standards, use of transmission and scanning electron microscopes, x-ray diffraction techniques, metallographic and microstructural analysis, and chemical/bulk elemental analysis capabilities. Mechanical testing includes micro- and macro-hardness testing, tension, torsion, shear and compression testing, dynamic fracture testing, fracture toughness and fatigue life testing, wear and corrosion testing.

#### **Product Liability, Design, Testing, and Evaluation:**

Failure and accident analysis relating to design defects, manufacturing defects, defective instructions, guardings, warnings and industrial standards compliance. Performance testing and safety evaluation of products. As part of a research and development team at Spyderco, Inc., created over 40 design and utility patents mostly involving design and utility of hand tools, knives, locking mechanisms and accessories. Design experience with hydraulic and other light-duty mechanical testing equipment, cooling systems, and sprinkler systems, quality control systems experience.

#### **Chemical/ Mechanical Systems:**

Analysis of HVAC systems, gas valves, boilers, radiant heating systems, water treatment systems, hot-water heaters, furnaces, refrigerators, water filter failures, electrical heater failures, carbon monoxide poisonings and fatalities, propane, natural gas and oil burning appliances, fuel gas systems, chemical processing units, brewing processes, beverage packaging processes and contaminated beverages. Testing and analysis of air quality, particulates, oils, gasoline, diesel, brake fluid/power steering fluid contaminations, wastewater analysis, testing and analysis of water sanitation systems/sanitation issues.

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**Fires and Explosions:**

A Certified Fire and Explosion Investigator (CFEI) investigating cause, origin, and responsibility of industrial and agricultural machinery fires, appliance fires, vehicular fires, residential and commercial structural fires and explosions. Mr. Kelley has investigated fatal fires and explosions in both residences and vehicles. Fire damage analysis and evaluation, fire and heat pattern analysis, analysis and testing of building fuel gas systems, chemical, natural gas/propane explosions, electrical fires, spontaneous combustion events, carbon monoxide poisonings and fatalities, failures and maintenance of water-based fire suppression systems and components.

**Industrial and Construction Accident Analysis:**

Analysis of accidents involving heavy equipment, forklifts, farm equipment, chemical tanks and burns, anhydrous ammonia systems and regulations, excavators, skid-steers, cranes, oil derricks, compressors, conveyor belts, land and brush clearing equipment, oil and gas pigging operation accidents, invert mud tank and oil storage tank explosions, trucks and elevators. Analysis and testing of power tools, gaming industry equipment, amusement park/recreational rides.

**Construction Defects:**

Identification and analysis of construction defects in residential and commercial construction including plumbing, roofing, flashing, insulation, ventilation, fire sprinkler installation, adequate lighting, stairway treads and handrails, guardrails, concrete placement and slab-on-grade settlement issues, and compliance with applicable building, construction and maintenance code requirements, and manufacturer's installation instructions.

**Slip, Trip and Fall Accident Analysis:**

Experience includes analysis of numerous slip, trip and fall cases as a result of falls from balconies, down stairs, from landings, on foreign substances, and ice and snow. Analysis incorporates building, construction, snow removal and maintenance code requirements, ambient light/visibility testing, warnings, design, and standard of care issues.

**Recreational Accident Analysis:**

**Ski Area Accidents**

Investigation of skier/skier collisions, skier/sit-skier collisions, skier/snowmobile collisions, and skier collisions with manmade objects within skiable terrain. Analysis of lift loading accidents and failures involving aerial tramways, aerial lifts, surface lifts, tows and conveyors, and determination of compliance with applicable maintenance requirements, standards, codes, rules and regulations, and industry best practice. Analysis of falls from aerial lifts. Determination of skier speed and momentum analysis, determination of uphill skier, and analysis of user pass details to assist in accident reconstruction.

**Ski Equipment and Ski Binding Analysis**

Determination of proper visual indicator settings on alpine bindings. Analysis of scores, marring, scratches, gouges, fractures, delaminations, and dents in ski equipment caused during collisions to aid in determining relative position of skiers and to assist in determination of the uphill skier.

**Snow Tubing Accidents**

Snow tubing accident analysis – analysis of tubing flume design and construction, operation, maintenance, and padding of the snow tubing flumes and barrier walls at the terminus of the flumes, state-of-the-art design and operation of snow tubing facilities, control and management of snow tubing patrons for collision avoidance. Mr. Kelley has investigated and reconstructed tubing accidents causing serious injury and death in California, Colorado, Ohio, and Virginia.

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#### **Ski Area Experience**

Mr. Kelley performs maintenance and repairs at the Lake City Ski Hill on the oldest operating ski lift in Colorado, and has assisted in the performance of wire rope inspections in Colorado. Additionally, Mr. Kelley has assisted in assessing the design and layout of trails and the terrain park at the Lake City Ski Hill, and volunteers much of his time in helping maintain the Lake City Ski Hill. Mr. Kelley has acted as a volunteer ski patroller at the Lake City Ski Hill, including bringing injured skiers down the slope in toboggans, placing signage, bamboo, padding, ropes demarcating lift loading and closed areas, and marking hazards.

#### **Rock Climbing**

Mr. Kelley has been rock climbing since 1990, and performs failure analysis and provides metallurgical insight to some of the industry's leading rock climbing gear manufacturers, and has assisted manufacturers through product recalls. Mr. Kelley performs analysis of climbing gear failures, anchor failures, rock and ice climbing accidents, rappelling accidents, as well as rock climbing and mountaineering accidents, and has conducted the impact resistance testing of certain types of helmets. Mr. Kelley is on the board of directors for Lake City Ice Climbs and volunteers his time designing, building, and maintaining the ice making system, and putting on the Lake City Ice Climbing Festival in Lake City, Colorado.

#### **Pocket Knife Accidents**

Mr. Kelley, as part of a research and development team, holds over 40 design and utility patents primarily regarding the design and locking mechanisms of pocket knives, and has performed analysis of pocket knife accidents involving serious injury and amputations.

#### **Outdoor Experience:**

- Snow skiing since 1977, having nearly exclusively telemarked since 1998.
- Made more than a dozen technical climbing ascents of big walls including ascents in Yosemite National Park (El Capitan, Middle Cathedral Spire), Zion National Park, the Diamond of Long's Peak, and several of the Fisher Towers in Utah (the Titan, Kingfisher, and Echo Tower).
- Traditional climbing since 1992 in Colorado, Utah, Oregon, Oklahoma, New Mexico, Wyoming, Hawaii, and California, with ascents of well over 1,500 routes.
- Ascent of Mount Ranier's Liberty Ridge, the Direct Exum Ridge of the Grand Teton, and 13 of the "50 Classic Climbs".
- Free soloed the Bastille Crack in Eldorado Canyon ten times in just under three hours (2000).
- Ascent of Pico de Orizaba (elev. 18,700 feet), the third highest peak in North America.
- Ski (telemark) descents of Oregon's Mount Hood, and Mount Jefferson, and numerous 14ers in Colorado, including Eolus, Sunlight and Windom.
- Climbed all of the 100 highest peaks in Colorado (2010)
- Climbed 155/200, and 232/637 of the ranked peaks in Colorado above 13,000 feet.
- Completed the San Juan Solstice 50 Mile Run ultramarathon in 2013 (12,856 feet of elevation gain in a time of 15:32:11)
- Completed the Jemez Mountain 50 Kilometer Trail Run ultramarathon in 2013 (7,052 feet of elevation gain in a time of 8:34:33)

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### **EXPERT TESTIMONY**

Provided testimony in both trials and depositions for both plaintiffs and defendants. Testified in both State and Federal courts.

### **PUBLICATIONS**

Brown DG, Kelley PB, Kluge WJ, Wheeler JB. Injury Mitigation Produced by Protective Padding on Ski Terrain. *Proceedings of the XIXth International Congress on Biomechanics*, Dunedin, New Zealand, July 6-12, 2003.

### **CONTINUING EDUCATION**

#### 2009 Rocky Mountain Lift Association (Completion of Introduction to Lift Maintenance Program):

- Accident Reconstruction (8 hrs)
- Overview of Ski Lift DC Motors/Drives, AC Motors/Drives, and Starting Methods
- Risk Management and Legal Update with Respect to Lift Operations
- Basic Wire Rope
- Mechanical Backstopping Clutches
- Ski Lift Operational Responsibilities
- Basic Hydraulic Schematics
- Rigging Basics and Sling Inspection
- ANSI B77.1 Ropeways Standard Review of Proposed Revisions
- Lift Incident and Worker Safety Roundtable
- Ski Lift Design and Construction in a Roadless Area

#### 2010 Rocky Mountain Lift Association (Completion of Lift Operations Training Program):

- Accident Reconstruction (4 hrs)
- Aviation Maintenance – Lessons Learned As They Apply to Ropeway Maintenance and Operations Today
- How Lifts Move and What Makes Them Safe – An Overview of Essential Lift Components
- OSHA for Lift Operations
- Top 10 Keys to Risk Management In Real-Life Application
- Building an Icon – Constructing the New Jackson Hole Tramway
- Snowmobile/ATV Safety – What's New and Mountain Use Overview
- Conveyors and Conveyor Loading Systems
- Adaptive Skiing and Snowboarding – Understanding Risk and How to Manage It
- Lift Operations Collides With Workers Comp
- Risk Management That Return Big Rewards

ASTM F27 Technical Committee on Snow Skiing – Spring 2012 Meeting attendee

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**PROFESSIONAL AFFILIATIONS AND CERTIFICATIONS**

Registered Professional Engineer in the State of Colorado (2003, License # 38105)  
American Alpine Club (Since 1997)  
National Association of Fire Investigators (NAFI)  
NAFI Certified Fire and Explosion Investigator (Since 2002)  
Hinsdale County Search and Rescue (High Angle Rescue Team, and Hasty Response Team)  
Board of Directors for Lake City Ice Climbs, LLC ([www.lakecityiceclimbs.com](http://www.lakecityiceclimbs.com))  
Rocky Mountain Lift Association (RMLA)  
Substitute Teacher at Lake City Community School for High School Math and Science  
National Association of Subrogation Professionals (NASP)  
Flight For Life Colorado Lift Ticket Holder – Hinsdale County SAR 2011-2012

**COMMUNITY VOLUNTEER WORK**

Mr. Kelley participates heavily in the community in which he lives by volunteering more than 100 hours a year of his time in the following areas:

- Coaching U6 Soccer (2008, 2009, 2010)
- Lake City Ice Climbs – designing, building and maintaining the ice production system, organizing and hosting the Lake City Ice Climbing Festival (2008, 2009, 2010, 2011, 2012)
- Volunteering at local community events such as the Lake City Wine and Music Festival (2007, 2008, 2009, 2010, 2011, 2012), Wee Care Day Care Town Dinner (2008, 2009, 2010), the Town 4<sup>th</sup> of July Celebration (2007, 2008, 2009, 2011), and Alfred Packer Days (2007, 2008, 2009)
- Volunteering at the Lake City Ski Hill maintaining the ski lift, performing trail maintenance and work, and teaching local kids and visitors how to ski.
- Hinsdale County Search and Rescue (2007, 2008, 2009, 2010, 2011, 2012, 2013)

**List of cases in which Patrick B. Kelley, M.E., P.E. has provided ARBITRATION testimony with count of Plaintiff versus Defense**

<u>Case Name</u>	<u>Attorney</u>	<u>Law Firm</u>	<u>City, State</u>	<u>Date</u>	<u>Plaintiff</u>	<u>Defense</u>
Holtz vs. Slant/Fin Corporation	Lori Hulbert	Brown & Hulbert, LLC	Denver, Colorado	5/12/11		1
Nolly vs. Highlands at Jordan, et. al.	Kenneth Morris	Garlin Driscoll, LLC	Denver, Colorado		1	
			Total		1	1
			2	50%	50%	

**List of cases in which Patrick B. Kelley, M.E., P.E. has provided DEPOSITION testimony with count of Plaintiff versus Defense**

<u>Case Name</u>	<u>Attorney</u>	<u>Law Firm</u>	<u>City, State</u>	<u>Date</u>	<u>Plaintiff</u>	<u>Defense</u>
Kaz's Place vs. Febco Manufacturing	Bruce Asay	Associated Legal Group, LLC	Cheyenne, WY	1/30/02	1	
Thorndike vs. Diamler Chrysler Corporation	Tom Newman	Murray, Plumb & Murray	US Dist., Bangor, ME	2/27/02		1
Birchall vs. Morgan Spas	Mark Biddison	Stevens, Littman, Biddison & Tharp	Eagle, CO	6/19/02	1	
Bogan vs. Briarwood	Gordon Rose	Rose & Radamacher	Los Angeles, CA	1/2/03	1	
Mitchell vs. The Willits Group, et. al.	Robert Wheeler	Wood, Ris & Harnes	Eagle, CO	3/12/03	1	
Storz vs. Idaho Sewing for Sports, et. al.	Larry Hayes	Fenton & Keller	Tahoe City, CA	3/28/03	1	
Gould vs. Country Coach	Robert P. Ingram	Dickenson, Prud'Homme, Adams & Ingram LLP	Aspen, CO	6/5/03		1
Mucho vs. Zerr Enterprises, Inc.	Martha Ferris	Lambdin & Chaney, LLP	Denver, CO	1/30/04		1
Spinner vs. Smith & Wesson	Nicholas Buonconti, III	Morgan Colling & Gilbert	Orlando, FL	11/17/04	1	
Hebert vs. Steamboat	Steve Shapiro	Fleishman & Shapiro	Steamboat Springs, CO	1/10/09	1	
Polonus vs. Semple	James Chalat	Chalat, Hatten & Koupal	Breckenridge, CO	4/15/09	1	
C & P Land & Livestock vs. The Grieve Corp.	Richard Gerber	Brown & James, P.C.	Waukegan, IL	9/23/09	1	
Ringle vs. Heritage Operating	Charlie Honsinger	Ringert Law	US Dist., Boise, ID	9/29/09	1	
Harris vs. Vail Summit Resorts, Inc. et.al.	Russell Hatten	Chalat Hatten & Koupal	Breckenridge, CO	1/8/10	1	
Margolis vs. Breen	James Chalat	Chalat Hatten & Koupal	US Dist., Denver, CO	4/21/11		1
Squires vs. Goodwin, et. al.	John Grund	Grund Dagner	US Dist., Denver, CO	4/25/11		1
Capetta vs. Vail Summit Resorts, Inc.	Chris Koupal	Chalat Hatten & Koupal	US Dist., Denver, CO	5/18/11	1	
Larimer County vs. Neenan, et. al.	Brett Godfrey	Godfrey & Lapuyade, P.C.	Ft. Collins, CO	9/15/11	1	
Carwile vs. Great Eastern Resort Corporation	Patrick Regan	Regan Zambri & Long	Charlottesville, VA	12/15/11	1	
Sawyer vs. Omega Pacific	Tim Wolf	Brown & James, P.C.	Kansas City, MO	5/22/12		1
Yeganeh vs. Charter Sports	Max Shaffer	Lathrop & Gage	Denver, CO	5/24/12	1	
Paulin vs. White, et. al.	John Case	Benson & Case	Denver, CO	6/19/12	1	
Korshak et. al. vs. Grand Lake Log Homes et. al.	Carl Dowdy	Gregory R. Giometti & Associates	Denver, CO	10/17/12		1
Vuich vs. Great Eastern Resort Management	Charles F. Hilton	Wharton, Aldhizer & Weaver, PLC	Charlottesville, VA	11/8/12	1	
Automobile Club vs. Slant/Fin	I. Hooshie Broomand	Newman Broomand	Santa Ana, CA	4/18/13		1
Day vs. Capitol Contractors, et. al.	Sarah Killeen	Cozen O'Connor	Santa Fe, NM	6/14/13	1	
Lexington Insurance Co. vs. Fire Materials Group, et. al.	Christina M. Stamper	Denenberg Tuffley, PLLC	Denver, CO	9/17/13	1	
Teresa Woods, et al. vs. Olonia Enterprises, et al.	Peter A. Ricciardelli	Law Offices of Peter A. Ricciardelli	Montrose, CO	9/20/13	1	
Dobbs vs. Reuter	James Chalat	Chalat, Hatten, Koupal & Bunker	Denver, CO	11/18/13	1	
Delgadillo vs. Westminster Promenade, et. al.	Michael Adams	Ray Lego and Associates	Denver, CO	12/10/13		1
Duckworth vs. The Marolt Group	Michael Adams	Ray Lego and Associates	Castle Rock, CO	6/25/14		1
Kaufmann vs. Ski Granby Ranch	James Chalat	Chalat, Hatten, Koupal & Bunker	Hot Sulphur Springs, CO	7/24/14	1	
			Total		22	10
				32	69%	31%

List of cases in which Patrick B. Kelley, M.E., P.E. has provided TRIAL testimony with count of Plaintiff vs. Defense

Case Name	Attorney	Law Firm	City, State	Date	Plaintiff	Defense
Roth vs. Kugler Oil	John Gehlhausen	John Gehlhausen, P.C.	Denver, CO	6/12/02	1	
Thorndike vs. Diamler Chrysler Corporation	Tom Newman	Murray, Plumb & Murray	US Dist., Bangor, ME	5/18/04		1
Farmers Insurance Exchange vs. Dennis Emery dba Emery Electric	Tom Dunford	Cozen O'Connor	Pueblo, CO	6/21/05	1	
Farmers Insurance Exchange vs. Dennis Emery dba Emery Electric	Tom Dunford	Cozen O'Connor	Pueblo, CO	4/19/06	1	
Ringle vs. Heritage Operating	Charlie Honsinger	Ringert Law	US Dist., Boise, ID	10/2/09	1	
Squires vs. Breckenridge Outdoor Education Center, et. al.	John Grund	Grund Dagner	US Dist., Denver, CO	4/4/12		1
Korshak et. al. vs. Grand Lake Log Homes et. al.	Carl Dowdy	Giometti and Associates	Hot Sulphur Springs, CO	3/13/13		1
Korshak et. al. vs. Grand Lake Log Homes et. al.	Carl Dowdy	Giometti and Associates	Hot Sulphur Springs, CO	3/14/13		1
					Total	4
					8	50%
						4
						50%